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Boris A. Rozenfeld: On the 70th Anniversary of His Birth

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August 30, 1987, marks the 70th birthday of the well-known Soviet historian of mathematics and active member of the International Academy of History of Science, Professor Boris Abramovich Rozenfeld. The reader of *Historia Mathematica* is already acquainted with the story of the first 60 years of B. A. Rozenfeld's life from the article in *HM* **4** (1977), 411–414.

In the last 10 years several new works by B. A. Rozenfeld have appeared on the history of the mathematical sciences in the medieval Orient and also on the history of geometry. First of all there is the three-volume book *Mathematicians and Astronomers of Medieval Islam and Their Works (8–17th Centuries)* (1983), prepared in collaboration with G. P. Matvievskaya, on which the authors worked for some 15 years. Here information is collected about Arabic, Persian, and Turkic medieval manuscripts on mathematics, astronomy, mechanics, and physics, and also on their editions, translations, and the studies devoted to them. In the first volume, which begins with an introductory article by the authors and the editor A. P. Yushkevich, there is a reference section and bibliography. The second volume

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contains information on more than a thousand scientists whose lifetimes are known, and the third on those whose lifetimes are unknown. The third volume also discusses anonymous manuscripts and contains indexes. The fourth volume, which at present is in preparation, will contain information published in the last few years and will fill certain gaps in the preceding volumes. Thanks to the wealth of information in this three-volume work, it will be a highly valued source of information for historians of medieval science (assuming, of course, that they know sufficient Russian).

Also in 1983 appeared the book *The Theory of Parallel Lines in the Medieval Orient: 9–14th Centuries*, by B. A. Rozenfeld and A. P. Yushkevich, in which all known attempts to prove Euclid's fifth postulate in the works of many Near- and Middle-Eastern scientists are collected and analyzed from the standpoint of modern geometry. This research is more complete and more detailed than that in the second chapter of B. A. Rozenfeld's book *History of Non-Euclidean Geometry* (1976) and in A. P. Yushkevich's *Les mathématiques arabes*, which appeared in French in the same year. We observe that almost 4 years later K. Jaouiche published a new book on the same question, *La théorie des parallèles en pays d'Islam*, in which the author was unable to use the results of Soviet researchers because, as Jaouiche says in his introduction, he did not know Russian.

Also in 1983, the translation of the ancient Jewish treatise *Straightening the Curved*, by the 14th century Spanish–Jewish scientist Alfonso (Avner of Burgos before his conversion), was published. It is devoted on the whole to infinitesimal methods, but also contains an attempt to prove the fifth postulate. A fragment from this treatise containing interesting information on ancient Greek mathematical atomism inspired the late Soviet historian of science S. Y. Luria to write his paper "Die Infinitesimaltheorie der antiken Atomisten," published in 1932 in German in *Quellen und Studien zur Geschichte der Mathematik, Astronomie und Physik* (Vol. 2) and in 1935 in Russian as a separate book. S. Y. Luria was the initiator of the translation of the whole of Alfonso's book. After S. Y. Luria's death (1964) B. A. Rozenfeld took on the mathematical editorship of this translation and supplied the mathematical commentary.

Other works that appeared in 1983 include the translation by B. A. Rozenfeld and M. M. Rozhanskaya of the Beirut manuscript of the treatise of al-Bīrūnī on specific weights, the translation by B. A. Rozenfeld of the treatise of al-Khāzin on Pythagorean triples, and the translation by J. al-Dabbagh under B. A. Rozenfeld's editorship of the commentaries of Quṭb al-Dīn al-Shirāzī on the treatise (not extant) of his teacher Naṣīr al-Dīn al-Ṭūsī *On the Motion of Rolling and on the Ratios between Plane and Curved Surfaces* devoted to infinitesimal methods; B. A. Rozenfeld helped prepare the commentary to all three treatises.

Finally, in the same year, 1983, in which the 1200th anniversary of the year of birth of Muḥammad al-Khwārizmī was widely celebrated (the exact year of birth of this famous scientist is unknown), several papers by B. A. Rozenfeld on his work appeared; among these is a biography of this first important member of the Baghdad scientific school, which was written jointly with P. G. Bulgakov and A.

A. Ahmedov. B. A. Rozenfeld was also one of the authors of a collection in the memory of al-Khwārizmī published under the editorship of A. P. Yushkevich.

In 1984 the mathematical treatises of Thābit ibn Qurra were published. Here are found translations of 35 mathematical, astronomical, mechanical, philosophical, and natural-scientific treatises of this famous 9th-century Baghdad scientist who played a major role in the development of geometry, algebra, number theory, infinitesimal methods, astronomy, and mechanics. B. A. Rozenfeld collected microfilms of manuscripts of these treatises over a period of 25 years. Their translation and commentaries were carried out by B. A. Rozenfeld himself and by his coworkers and students. At the present time the seventh volume of the selected works of al-Bīrūnī, containing a translation by B. A. Rozenfeld and P. G. Bulgakov of al-Bīrūnī's treatise *Shadows*, devoted to mathematics, astronomy, and optics, with their commentaries, is in the course of publication.

As we see, B. A. Rozenfeld is extremely active and with good reason he can be called the leading Soviet researcher in the domain of the history of science of the medieval Orient.

At the same time, as was said above, B. A. Rozenfeld worked intensively in a different area: the history of geometry.

In 1981 the chapter "Geometry" by B. A. Rozenfeld and B. L. Laptev, professor at Kazan University, appeared in the monograph *Mathematics of the 19th Century*, edited by A. N. Kolmogorov and A. P. Yushkevich. At present the chapter "Geometry" by B. A. Rozenfeld for the similar monograph *Mathematics of the 20th Century* is being prepared for publication. Let us add that the English translation of B. A. Rozenfeld's *History of Non-Euclidean Geometry* is in the course of publication by Springer-Verlag, New York. This edition has been revised and extended.

During the decade under consideration B. A. Rozenfeld continued his pedagogical activity at the Lenin Moscow State Pedagogical Institute where he systematically taught the course on history of mathematics and special courses on geometry as well as supervised postgraduate students; he also gave cycles of lectures on the history of mathematics and geometry in many universities and pedagogical institutes in this country. The number of published works by B. A. Rozenfeld up to now has reached 335 (we give the list of the most important of them below); the number of his students who have obtained a Ph.D. ("candidate's") degree is 61.

He meets his seventies full of energy and creative power. On the occasion of his 70th birthday we, his colleagues and comrades, wish B. A. Rozenfeld good health and continued scientific success.

LIST OF THE MOST IMPORTANT WORKS OF B. A. ROZENFELD

1. 1940. Mathematical theory of the scale of the circular diagram. *Elektrichestvo*, 62–64 (Russian).

2. 1942. *Geometry of spherical manifolds*. Candidate's (Ph.D.) thesis, Moscow University. Published: *Uchenye Zapiski Moskva Universitet (Matem.)* **73**, 1944, 49–82 (Russian).

3. 1947. Theory of families of subspaces. Doctor (Sc.) thesis, Moscow University. Published:

Izvestiya Akademii Nauk SSSR (Matem.) **11,** 1947, 283–308; *Matematicheskii Sbornik* **22,** 1948, 457–492; **23,** 1948, 297–313; **24,** 1949, 53–74, 405–428 (Russian).

4. 1950. Spaces with affine connection and symmetric spaces. *Uspekhi Matematicheskikh Nauk* **5,** 72–147 (Together with A. A. Abramov) (Russian).

5. 1951. On the mathematical works of Naṣīr al-Dīn al-Ṭūsī. *Istoriko-matematicheskie Issledovaniya* **4,** 489–512 (Russian); *Scientia Sinica* **7,** 1958, 88–100 (Chinese).

6. 1955. *Non-Euclidean geometries*. Moscow: GITTL (Russian).

7. 1956. Geometrical interpretation of compact simple Lie groups of class E. *Doklady Akademii Nauk SSSR* **106,** 600–603 (Russian).

8. 1956. *Jamshīd Ghiyāth al-Dīn al-Kāshī. Key of arithmetic. Treatise on a circumference*. Text, translation, and commentary. Moscow: GITTL (Together with A. P. Yushkevich). Prelude published: *Istoriko-matematicheskie Issledovaniya* **7,** 1954, 11–449 (Russian).

9. 1957. Geometrical transformations in the works of Leonhard Euler. *Istoriko-matematicheskie Issledovaniya* **10,** 371–422 (Russian).

10. 1957. *'Umar Khayyām—poet, thinker, scientist*. Dushanbe, Tajikgosizdat (Together with S. B. Morochnik) (Russian).

11. 1957. Geometry of rectangular matrices and its application to real projective and non-Euclidean geometry. *Izvestiya Vysshikh Uchebnykh Zavedenii*, 238–247; *Scientia Sinica* **6,** 1957, 995–1011 (Russian); *Acta Mathematica Sinica* **8,** 1958, 132–145 (Together with Loo-Keng Hua) (Chinese).

12. 1958. Proofs of Euclid's 5th postulate by the medieval mathematicians al-Ḥasan ibn al-Haytham and Levi ben Gerson. *Istoriko-matematicheskie Issledovaniya* **11,** 735–787 (Russian).

13. 1960. Die Mathematik der Länder des Osten im Mittelalter. *Iz Istorii Nauki v Stranakh Vostoka* **1,** 349–421 (Russian); and in *Sowjetische Beiträge zur Geschichte der Naturwissenschaft*, G. Harig, Ed., pp. 62–160. Berlin: Deutscher Verlag der Wissenschaften (Together with A. P. Yushkevich) (German).

14. 1959. Einfache Lie-Gruppen und nichteuklidische Geometrien. In *Algebraical and topological foundations of geometry. Proceedings of a colloquium held in Utrecht, August 1959*, pp. 135–155. Oxford/London/New York/Paris: Pergamon, 1962.

15. 1960. Aghanis's proof of Euclid's fifth postulate. *Izvestiya Akademii Nauk Arm. SSR (Phys.-math.sc.)* **13,** 153–164 (Together with G. B. Petrosyan) (Russian).

16. 1960. Naṣīr al-Dīn al-Tūsī. Treatise curing the doubt on parallel lines. Paper, translation, and commentary. *Istoriko-matematicheskie Issledovaniya* **13,** 475–532 (Together with A. P. Yushkevich) (Russian).

17. 1960. Treatise on the determination of the sine of one degree. Paper, translation, and commentary. *Istoriko-matematicheskie Issledovaniya* **13,** 533–556 (Together with A. P. Yushkevich) (Russian).

18. 1961. Thābit ibn Qurra. Book on the proof of the famous Euclid's postulate. Shams al-Dīn al-Samarqandī. Fundamental propositions (fragment). Paper, translation, and commentary. *Istoriko-matematicheskie Issledovaniya* **14,** 587–602 (Together with A. P. Yushkevich) (Russian).

19. 1962. Theory of relativity and geometry. In *Einstein i razvitie fiziko-matematicheskoi mysli*, Akademiya Nauk SSSR, Institut istorii estestvoznaniya i tekhniki, Ed., pp. 10–62. Moscow: Akademiya Nauk SSSR (Russian).

20. 1962. *Umar Khayyām. Treatises*. Paper, texts, translation, and commentary. Moscow: IVL (pp. 1–179, together with A. P. Yushkevich). Prelude published: *Istoriko-matematicheskie Issledovaniya* **6,** 1953, 11–72 (Russian).

21. 1962. The star catalogue of al-Bīrūnī and the star catalogues of Khayyām and al-Ṭūsī. Translation and commentary. *Istoriko-astronomicheskie Issledovaniya* **8,** 33–192 (Russian).

22. 1963. Al-Bīrūnī. On the determination of chords in a circle. The book on Indian rashikat. Paper, translation, and commentary. *Iz Istorii Nauki v Stranakh Vostoka* **3,** 71–166 (Together with S. A. Krasnova & M. M. Rozhanskaya) (Russian).

23. 1963. Thābit ibn Qurra. Book on the fact that two lines produced at two angles less than two right angles will meet. Translation and commentary. *Istoriko-matematicheskie Issledovaniya* **15,** 363–380 (Russian).

24. 1963. Naṣīr al-Dīn al-Ṭūsī. Collection on arithmetic using a board and dust. Translation of the section on binom and commentary. *Istoriko-matematicheskie Issledovaniya* **15,** 432–444 (Together with S. A. Ahmedov) (Russian).

25. 1963. Umar Khayyām. The first algebraical treatise. Translation and commentary. *Istoriko-matematicheskie Issledovaniya* **15,** 445–472 (Together with S. A. Krasnova) (Russian).

26. 1963. On studies in the history of mathematics in the Middle Ages. *Istoriko-matematicheskie Issledovaniya* **15,** 51–72 (Together with V. P. Zubov & A. P. Yushkevich) (Russian).

27. 1964. *Muḥammad al-Khwārizmī. Mathematical treatises.* Translation and commentary. Tashkent: Fan (Together with Y. H. Kopelevich) (Russian).

28. 1964. Projective metrics. *Uspekhi Matematicheskikh Nauk* **19,** 51–113 (Together with I. M. Yaglom & E. U. Yasinskaya) (Russian).

29. 1965. *Umar Khayyām.* Moscow: Nauka (Together with A. P. Yushkevich) (Russian).

30. 1965. Analytical principle of continuity in geometry. *Istoriko-matematicheskie Issledovaniya* **16,** 273–294 (Russian); *Archives Internationales d'histoire des Sciences* **70–71,** 3–22 (English).

31. 1966. *Multidimensional spaces.* Moscow: Nauka (Russian).

32. 1966. *Thābit ibn Qurra. Book on compound ratios.* Paper, translation, and commentary. *Fiziko-matematicheskie Nauki v Stranakh Vostoka* **4,** 5–41 (Together with L. M. Karpova) (Russian).

33. 1966. Arabic and Persian physico-mathematical manuscripts in the libraries of the Soviet Union. *Fiziko-matematicheskie Nauki v Stranakh Vostoka* **4,** 256–289 (Russian).

34. 1967. *Abū 'Alī ibn Sīnā. Mathematical chapters of the Book of Knowledge.* Paper, translation, and commentary. Dushanbe: Irfon (Together with N. A. Sadovsky & S. U. Umarov) (Russian).

35. 1968. *Alexander Petrovich Kotelnikov (1865–1944).* Moscow: Nauka (Together with T. V. Putyata, B. L. Laptev, & B. N. Fradlin) (Russian).

36. 1968. Die Entwicklung der mathematikhistorischen Forschungen in der UdSSR. *Voprosy Istorii Estestvoznaniya i Tekhniki* **23,** 10–17 (Russian); *Schriftenreihe für Geschichte der Naturwissenschaften, Technik und Medizin* **5,** 44–54 (German).

37. 1969. *Non-Euclidean spaces.* Moscow: Nauka (Russian).

38. 1970. *History of mathematics from the most ancient times to the beginning of the new times-History of mathematics from the most ancient times to the beginning of the 19th century,* vol. 1, A. P. Yushkevich, Ed. Moscow: Nauka (Together with A. P. Yushkevich, I. G. Bashmakova, E. I. Beryozkina, & A. I. Volodarsky) (Russian).

39. 1970. *Mathematics of the 17th century-History of mathematics from the most ancient times to the beginning of the 19th century,* vol. 2, A. P. Yushkevich, Ed. Moscow: Nauka (Together with A. P. Yushkevich, I. G. Bashmakova, & others) (Russian).

40. 1972. *Mathematics of the 18th century-History of mathematics from the most ancient times to the beginning of the 19th century,* vol. 3, A. P. Yushkevich, Ed. Moscow: Nauka (Together with A. P. Yushkevich, I. G. Bashmakova, & others) (Russian).

41. 1972. *Al-Fārābī. Mathematical treatises.* Paper, translation, and commentary. Alma-Ata: Nauka (Together with M. F. Bockstein, S. A. Krasnova, A. K. Kubesov, & others) (Russian).

42. 1973. Geometrical interpretation of quasisimple exceptional Lie groups of class E_7 and E_8. *Doklady Akademii Nauk SSSR* **211,** 289–292 (Russian).

43. 1973. *Abū'l-Rayḥān al-Bīrūnī*. Moscow: Nauka (Together with M. M. Rozhanskaya & Z. K. Sokolovskaya) (Russian).

44. 1973. *Abū Rayḥān Bīrūnī* (for his millenary). Moscow: Nauka (Together with B. M. Kedrov) (Russian).

45. 1973. Stereographic projection. Moscow: Nauka (35 pages, Russian); Moscow: Mir (54 pages, English; 48 pages, Spanish) (Together with N. D. Sergeeva).

46. 1973/76. *Abū'l-Rayḥān al-Bīrūnī. Masudic Canon-Selected works*, vol 5. Papers, translation, and commentary. Two parts. Tashkent: Fan. (Together with P. G. Bulgakov, A. A. Ahmedov, & others) (Russian).

47. 1973. Al-Kāshī (or al-Kāshānī). *Dictionary of Scientific Biography* **7,** 255–262 (Together with A. P. Yushkevich).

48. 1973. Al-Khayyāmī (or Khayyām). *Dictionary of Scientific Biography* **7,** 323–334 (Together with A. P. Yushkevich).

49. 1973. Lobachevsky. *Dictionary of Scientific Biography* **8,** 428–435.

50. 1974. A medieval physico-mathematical manuscript newly discovered in the Kuibyshev Regional Library. *Voprosy Istorii Estestvoznaniya i Tekhniki*, **2–3 (47–48)**, 123–124 (Russian); *Historia Mathematica* **2,** 67–73 (English).

51. 1974. The treatise of Thābit ibn Qurra on sections of a cylinder and on its surface. *Archives Internationales d'histoire des Sciences* **24,** 66–72 (Together with L. M. Karpova).

52. 1974. Umar Khayyām. Discussion on the musical types formed by a fourth. *Istoriko-matematicheskie Issledovaniya* **19,** 273–294 (Together with N. G. Khairetdinova) (Russian).

53. 1975. The algebraical treatise of al-Samaw'al. *Istoriko-matematicheskie Issledovaniya* **20,** 125–149 (Russian).

54. 1975. *Al-Fārābī. Commentaries to Ptolemy's Almagest*. Paper, translation, and commentary. Alma-Ata: Nauka (Together with A. K. Kubesov & J. al-Dabbagh) (Russian).

55. 1975. *Abū'l-Rayḥān al-Bīrūnī. The book of the instruction in the elements of the science on stars-Selected works*, vol. 6. Papers, translation, and commentary. Tashkent: Fan (Together with A. A. Ahmedov, A. Abdurahmanov, & others) (Russian).

56. 1975. Who was the author of the "Treatise on the determination of the sine of one degree"? *Obshchestvennye Nauki v Uzbekistane*, 51–53 (Together with A. A. Ahmedov) (Russian).

57. 1976. The list of physico-mathematical works of Ibn al-Haytham written by himself. *Istoriko-matematicheskie Issledovaniya* **3,** 75–76 (English).

58. 1976. Viète's vectors and pseudovectors and their role in the creation of analytic geometry. *Istoriko-matematicheskie Issledovaniya* **21,** 102–109 (Russian).

59. 1976. Thābit ibn Qurra. *Dictionary of Scientific Biography* **13,** 288–295 (Together with A. T. Grigoryan).

60. 1976. *Reader on history of mathematics. Arithmetic and algebra. Theory of numbers. Geometry*, A. P. Yushkevich, Ed. Translation and commentary. Moscow: Prosveshchenie (Together with A. P. Yushkevich, I. G. Bashmakova, & S. S. Demidov) (Russian).

61. 1976. *History of non-Euclidean geometry. The development of the notion of geometrical space*. Moscow: Nauka (Russian).

62. 1976. Non-Euclidean geometry in the second half of the 19th century and in the 20th century. In *150 let geometrii Lobachevskogo*, pp. 96–106. Moscow: Nauka (Russian).

63. 1977. Mathematics. In *History of natural sciences in Russia from the 16th century to the beginning of the 20th century*, pp. 47–66, 150–170, 260–295. Moscow: Nauka (Together with A. P. Yushkevich) (Russian).

64. 1978. Arabic version of Diophantus's Arithmetic. *Istoriko-matematicheskie Issledovaniya* **23,** 191–249 (Together with I. G. Bashmakova & E. I. Slavutin) (Russian).

65. 1978. Cartography—One of the earliest works of al-Bīrūnī which come to us. In *Matematika na srednevekovom Vostoke,* pp. 127–153. Tashkent: Fan (Together with A. A. Ahmedov) (Russian).

66. 1979. On the geometrical works of Duncan Sommerville (for his centenary). *Istoriko-matematicheskie Issledovaniya* **24,** 247–257 (Russian).

67. 1980. On the mathematical works of Quṭb al-Dīn al-Shirāzī. *Istoriko-matematicheskie Issledovaniya* **25,** 328–334 (Russian).

68. 1980. Ibn al-Haytham. Treatise on burning mirrors. *Istoriko-astronomicheskie Issledovaniya* **15,** 305–338 (Together with I. O. Mohammed & N. V. Orlova) (Russian).

69. 1980. On the works of Iranian scientists of 10–11th centuries al-Irānshahrī and al-Rāzī in the physics. *Voprosy Istorii Estestvoznaniya i Tekhniki,* 106–111 (Together with N. K. Marupov) (Russian).

70. 1980. Ibn Sīnā's works in mathematics and astronomy. In *Abū 'Alī ibn Sīnā. K 1000-letiyu so dnya rozhdeniya,* pp. 157–163. Tashkent: Fan (Russian); and in *XVIth International Congress of the History of Science. Bucharest, 1981. Papers by Soviet scientists. The 1000th anniversary of Ibn Sīnā's birth,* pp. 2–12. Moscow: Nauka (English).

71. 1981. Geometry. In *Mathematics of the 19th century,* vol. 2, A. N. Kolmogorov & A. P. Yushkevich, Eds., pp. 9–114. Moscow: Nauka (Together with B. L. Laptev) (Russian).

72. 1981. Finite geometries with simple, semisimple and quasisimple fundamental groups. In *Trudy geometricheskogo seminara Kazanskogo universiteta* **13,** 63–70 (Russian); *The geometric vein. The Coxeter Festschrift,* pp. 477–484. New York/Heidelberg/Berlin: Springer (Together with I. N. Kashirina & N. I. Khairetdinova) (English).

73. 1982. *Al-Nayrīzī. Treatise on the proof of the famous Euclid's postulate.* Translation and commentary. *Istoriko-matematicheskie Issledovaniya* **26,** 325–329 (Together with A. Abdurakhmanov) (Russian).

74. 1983. Abū'l-Rayḥan al-Bīrūnī. On ratios between metals and precious stone by volume. Translation and commentary. *Nauchnoe Nasledstvo* **6,** 141–160, 309–316 (Together with M. M. Rozhanskaya) (Russian).

75. 1983. Muḥammad ibn al-Ḥusayn. Letter on the proof of the fact that the sides of two square numbers whose sum is a square cannot be odd. Translation and commentary. *Nauchnoe Nasledstvo* **6,** 161–174, 316–321 (Russian).

76. 1983. Quṭb al-Dīn al-Shirāzī. Commentaries to the "Treatise on the motion of rolling and on the ratios between plane and curved surfaces." Text, translation, and commentary. *Nauchnoe Nasledstvo* **6,** 175–228, 321–330 (Together with J. al-Dabbagh) (Russian).

77. 1983. Metasymplectic geometries as geometries on absolutes of Hermitean planes. *Doklady Akademii Nauk* **268,** 556–559 (Together with T. A. Stepashko) (Russian).

78. 1983. *The theory of parallel lines in the medieval Orient, 9–14th centuries.* Moscow: Nauka (Together with A. P. Yushkevich) (Russian).

79. 1983. *Mathematicians and astronomers of medieval Islam and their works (8–17th centuries),* 3 volumes. Moscow: Nauka (Together with G. P. Matvievskaya) (Russian).

80. 1983. Works of mathematicians and astronomers of medieval Islam (8–17th centuries). In [79], vol. 1, pp. 11–99, vol. 3, pp. 333–335 (Together with G. P. Matvievskaya & A. P. Yushkevich) (Russian).

81. 1983. *Muḥammad al-Khwārizmī (ca. 783–ca. 850).* Moscow: Nauka (Together with P. G. Bulgakov & A. A. Ahmedov) (Russian).

82. 1983. Non-elementary mathematics in the works of al-Khwārizmī. In *Muḥammad ibn Mūsā al-Khwārizmī. K 1200-letiyu so dnya rozhdeniya,* pp. 135–140. Moscow: Nauka (Russian).

83. 1983. The astronomical and geographical works of al-Khwārizmī. In *Muḥammad ibn Mūsā al-Khwārizmī. K 1200-letiyu so dnya rozhdeniya*, pp. 141–191. Moscow: Nauka (Together with A. A. Ahmedov & N. D. Sergeeva) (Russian).

84. 1983. Muḥammad al-Khwārizmī. Book on addition and substraction (extant fragments). Ingenious thoughts from his actions—the determinations of the azimuth using an astrolabe. Construction of the hour lines on the plane of a sun-dial. Book of history (extant fragments). In *Muḥammad ibn Mūsā al-Khwārizmī. K 1200-letiyu so dnya rozhdeniya*, pp. 213–260. Moscow: Nauka (Together with J. al-Dabbagh & others). (Russian).

85. 1983. The spherical astrolabe of al-Rūdānī. *Istoriko-astronomicheskie Issledovaniya* **16,** 235–255 (Together with K. G. Bolshakova & K. I. Nevskaya).

86. 1986. *Alfonso. Meyyashēr 'aqōb* (Straightening the curved). Papers, text, translation, and commentary. Moscow: Nauka (Together with S. Y. Luria & G. M. Gluskina) (Russian).

87. 1984. *Thābit ibn Qurra. Mathematical treatises*. Paper, translation of 35 treatises, and commentary. *Nauchnoe Nasledstvo*, vol. 8. Moscow: Nauka (Together with J. al-Dabbagh, L. M. Karpova, G. P. Matvievskaya, & others) (Russian).

88. 1984. The astronomy of Islamic countries. *Istoriko-astronomicheskie Issledovaniya* **17,** 67–122 (Russian).

89. 1984. On the development of geometry of spaces over algebras. *Izvestiya Vysshikh Uchebnykh Zavedenii (Matematika)*, pp. 33–44 (Together with V. V. Vishnevsky & A. P. Shirokov).

90. 1984. The unknown treatises of al-Khwārizmī. *Obshchestvennye Nauki v Uzbekistane*, pp. 45–47 (Together with A. A. Ahmedov) (Russian).

91. 1985. "Densimetry" of al-Bīrūnī. *Voprosy Istorii Estestvoznaniya i Tekhniki*, pp. 91–95.

92. 1985. Abū Sa'īd al-Sijizī. Book on the measurement of spheres by spheres. Paper, translation, and commentary. *Istoriko-matematicheskie Issledovaniya* **29,** 321–333 (Together with R. S. Safarov & E. I. Slavutin) (Russian).

93. 1986. The eminent Central Asiatic scientist al-Farghānī. *Obshchestvennye Nauki v Uzbekistane*, pp. 29–37 (Russian).

94. 1986. Inversion with respect to a circle and inversions with respect to an ellipse, a hyperbola and a parabola in Apollonius's Conica. *Istoriko-matematicheskie Issledovaniya* **30,** 195–199 (Russian).